Recovery Plan

for

St. Croix Population

of the

Leatherback Turtle

(*Dermochelys coriacea*)

Prepared by

Region 4

of the

U.S. Fish and Wildlife Service

August 1981

F. Eugene Hester
Approved

October 23, 1981
Date

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RECOVERY PLAN FOR THE ST. CROIX POPULATION OF THE LEATHERBACK TURTLE, DATED OCTOBER 23, 1981, PREPARED BY THE U.S. FISH AND WILDLIFE SERVICE IN COOPERATION WITH DR. GAIL S. BAKER, FISH AND WILDLIFE BIOLOGIST, U.S. FISH AND WILDLIFE SERVICE.

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Part I - Introduction

A. Biological Uniqueness

Of the seven species of sea turtles in the world, the leatherback is the largest and most unique. It is so divergent in morphology that it is placed in a separate family, Dermochelyidae; all other sea turtles are in the Cheloniidae. The median carapace length in the west Atlantic is approximately 1525 mm (61 in.) long, though lengths of close to 1800 mm (6 ft.) have been recorded. The unconfirmed records of 2400 mm (8 ft.) or 2700 mm (9 ft.) long leatherbacks are probably apocryphal. Leatherback weights have also been exaggerated. The average weight is probably around 363 kg (800 lbs.) and the maximum, 590 kg (1,300 lbs.).

The external characteristics of this species immediately distinguish it from all other sea turtles, which have horny or bony plates on the carapace. The carapace of the leatherback has the texture of rubber; it is somewhat flexible but is characterized by seven hard longitudinal ridges. There is no sharp angle between the carapace and the much softer plastron. This results in the animal being somewhat barrel-shaped. The limbs are modified as flippers which lack claws. The front flippers are very long, and may span 2700 mm (9 ft.) in an adult specimen. The dominant color of this turtle is black, with varying degrees of white spotting. The undersurface is mostly pinkish-white.

Internally the leatherback sea turtle is also distinctive. The skeleton of an adult retains many embryonic characteristics found only in hatchlings of other species. For example, the limb bones retain extensive cartilaginous ends, and the skull and pelvis contain so much cartilage that these parts fall apart when the skeleton is dried. The "shell" of the leatherback is about 37.5 mm (1.5 in.) thick, and is made primarily of tough, greasy cartilage. Just under the carapace skin of an adult leatherback is a continuous layer of mosaic bones a few millimeters thick; these bones are enlarged and thickened along the longitudinal ridges.

Leatherback sea turtles are mainly pelagic, entering the shallow waters of bays and estuaries only occasionally. They have several anatomical features which may be adaptations for diving. It is known that other soft-skinned turtles have the capability of carrying on gas exchange through the skin. It is likely that leatherbacks have the same ability, since they do have sphincter muscles in the pulmonary arteries which are capable of diverting blood from the lungs to the skin. This species has an extensive network of superficial capillaries which lie so near the surface on the underside of the animal that the unpigmented areas often appear pink.

There is some evidence that in colder waters the leatherback can maintain body temperatures considerably higher than that of its surroundings. In one instance, the deep body temperature of a leatherback was 18°C (32.4°F) above that of the water from which it was taken. Principal adaptations favoring retention of heat generated from muscular activity include the existence of a countercurrent heat exchanger (arteries and veins arranged in close proximity) in the front and rear flippers, the presence of a thick layer of subepidermal fat, and a large body mass.

Another interesting feature is the oil which is found within both the skeleton and flesh of the animal. Several theories about the purpose of this oil have been formulated. A likely explanation is that, as in certain whales, it functions in lessening decompression problems during rapid diving and resurfacing. It may also function in thermoregulation.

The diet of the leatherback consists primarily of soft-bodied animals such as jellyfish and tunicates together with juvenile fish, amphipods and other organisms which are associated with them. Attempts to raise hatchlings artificially have been largely unsuccessful, as have attempts to keep adult leatherbacks in captivity. Feeding seems to be a major problem, and captives that are not fed often survive longer than those which are fed. If given fish to eat, these turtles may become fatally packed with undigested food. In the early 1970's the Miami Seaquarium raised several leatherback hatchlings for several months. Their diet consisted entirely of jellyfish (Cassiopea), and the turtles were capable of eating about twice their weight in jellyfish daily. Phillips raised three leatherbacks for 8 months on a diet of minced chicken livers. The Seaquarium turtles died, but Phillips released his into the Gulf of Mexico.

Another problem with captive leatherbacks is their proclivity for swimming into the walls of the pool or tank in which they are kept. Hendrickson, who claims success in raising hatchlings to weights of over 20 pounds, stipulates that the turtles be kept in a soft-walled tank to to prevent serious injury, and that all skin injuries be treated with gentian violet. He also specifies that the young turtles be fed soft food; he suggests chopped squid. Hendrickson also specifies that the temperature should be kept at a constant 26.7°C (80°F), saying that lower temperatures also can lead to death due to intestinal impaction, but Phillips kept his specimens at 23°C (73.4°F), saying that it prevented injuries from too much activity.

B. World-wide Distribution

Outside the nesting beaches, there is no place where leatherback sea turtles can predictably be seen or caught. There are records of leatherbacks from nearly all over the world, and there are more leatherback locality records from cold, northern waters than for any other species of sea turtle. For example, the greatest concentration of non-nesting leatherback records in the Atlantic is around the Gulf of Maine. This may be because leatherbacks feed preferentially on Cyanea, a large jellyfish common in colder oceans. Principal foraging areas in the western hemisphere are located near land masses in tropical waters north of the equator. These and other foraging areas are shown in Figure 1.

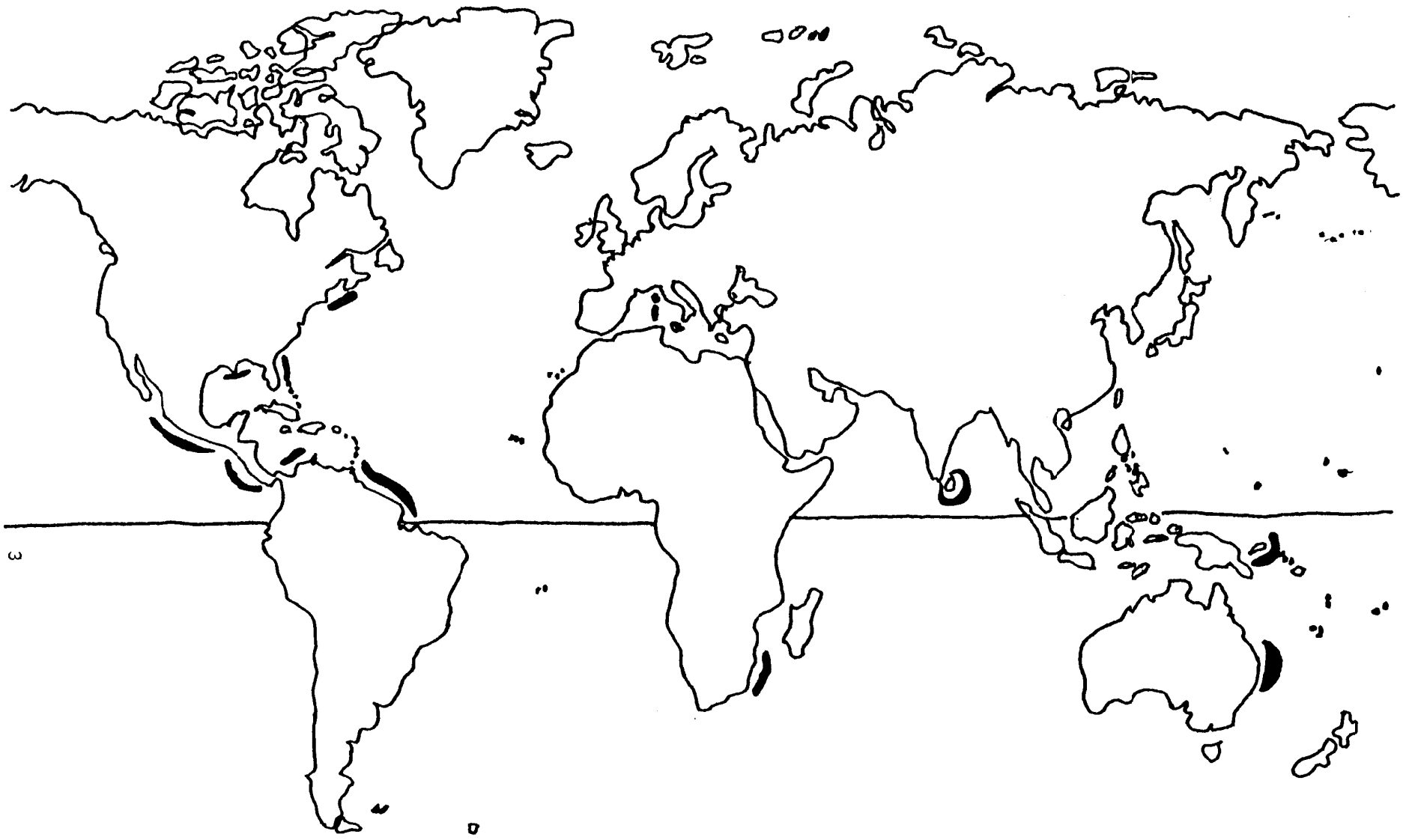

Figure 1. Principal foraging areas for the leatherback sea turtle.

C. Life Cycle, Migrations

Little is known about the life history of the leatherback since juvenile turtles are rarely, if ever, observed.

Courtship and mating are believed to occur in water adjacent to the nesting beaches just prior to the time of egg laying, but no systematic search for mating pairs during the nesting season has ever been carried out. Nesting habits of the leatherback turtle are well known since nesting is the only part of the life cycle that can be readily observed by researchers. In the northern hemisphere, nesting begins in March and continues into July. Renesting occurs six or seven times a season where it has been intensively studied (mostly in French Guiana). Certain individuals have been known to nest eight or nine times per season. Limited data suggest that most females may nest every other year.

The female leatherbacks nest at night, even in rainy weather. They are not easily perturbed. Lights do not disturb them as they do other sea turtle species, and they can be tagged as they first come up out of the sea. Usually the time on shore is 1-1/2 to 2 hours. In Surinam and French Guiana, an average of 86 whole eggs are laid, plus an average of about 30 smaller yolkless eggs. The incubation period is about 60 days, and the hatchlings emerge "explosively," usually shortly after dark.

Because leatherback sea turtles are rarely seen outside of the nesting beaches, very little is known of their migrations. There appears to be some form of migration, possibly from nesting grounds in New Guinea, down the east coast of Australia. Also, they turn up off the Maritime Provinces of Canada and in the western Mediterranean Sea often enough that there may be some migration to these areas. There have been very few long-distance recoveries of tagged individuals. However, five females tagged while nesting in Surinam and French Guiana were recovered later. Four were later seen near the coasts of New Jersey, South Carolina, Texas, and Mexico; and one was recovered a few months later off the coast of Ghana, West Africa, 6,800 kilometers (4,226 miles) away!

D. Nesting Areas

Some of the leatherback nesting beaches have been known to science for many years, while others have only recently been "discovered," i.e., described in technical literature. In a few cases, records 40 to 50 years old are the only item in the literature. Leatherback nesting beaches are found in many areas of the world. (See Figure 2.)

In West Africa, there are records of leatherbacks nesting from Senegal to Angola, but no detailed information is available. A 60-mile stretch of beach called the Tongaland Coast in the Republic of South Africa is the nesting site for 200-400 female leatherback sea turtles and some nesting also takes place on the southern coast of Mozambique. A similar number of turtles uses the coast of southern India and the Island of Ceylon (Sri Lanka).

There are two nesting areas on the Maylay Peninsula; the largest one 12.1 kilometers (7.5 miles) of beach. Fewer turtles nest near and on the Island of Phuket, Thailand, on the other side of the peninsula. In the South Pacific area there is a "diffuse" nesting ground in the area of northern New Guinea and the Solomon Islands, but it has not been extensively studied. A record exists of two leatherbacks nesting in Fiji in 1969.

On the other side of the Pacific, leatherbacks nest from the coast of Jalisco, Mexico, through Central America and down onto the coast of Ecuador. The greatest concentration of nesting occurs along the beaches of the Mexican States of Oacaca and Chiapas. This 644 kilometer (400 mile) stretch of beach may be the world's largest leatherback nesting area, and may be used by as many as 50,000 leatherback females. Since this area was surveyed in 1980, the estimate for the number of adult breeding female leatherbacks in the world has increased from 40,000 to 104,000.

In the western Atlantic, leatherback sea turtles are known to nest in several areas. Annual low-level nesting occurs in Florida; particularly the lower east coast, but probably fewer than 25 leatherbacks nest each year in the continental United States. There are records of nests from eastern Mexico and Central America, but the only concentration occurs in Costa Rica at Matina which is used by at least 1,000 females. There are isolated records of leatherbacks nesting on several Caribbean Islands, but the only known concentrations occur on St. Croix in the U.S. Virgin Islands which is used by 50-70 leatherbacks, and on the Island of Hispanola in the Dominican Republic which may be used by 200 or so.

Trinidad is another Caribbean Island, though very close to the mainland of Venezuela, where leatherback nesting is concentrated; probably 300-500 females use it. There are nesting records from the Venezuelan Coast and the northwestern district of Guyana. It is known that 200-250 leatherbacks nest along the Gulf of Uraba on the coast of Colombia. Probably 200-400 leatherback sea turtles nest in Surinam on the Bigi Santi beach in the Wia Wia Nature Preserve. The most studied population of nesting leatherbacks is found in French Guiana. A stretch of beach 16-24 kilometers (10-15 miles) long is used by about 15,000 female leatherbacks. The Surinam population, just on the other side of the Marowijne River which separates the two countries, may simply be "overflow" from the French Guiana population. There are several historical accounts of leatherback nesting in Brazil but no studies have been done there recently.

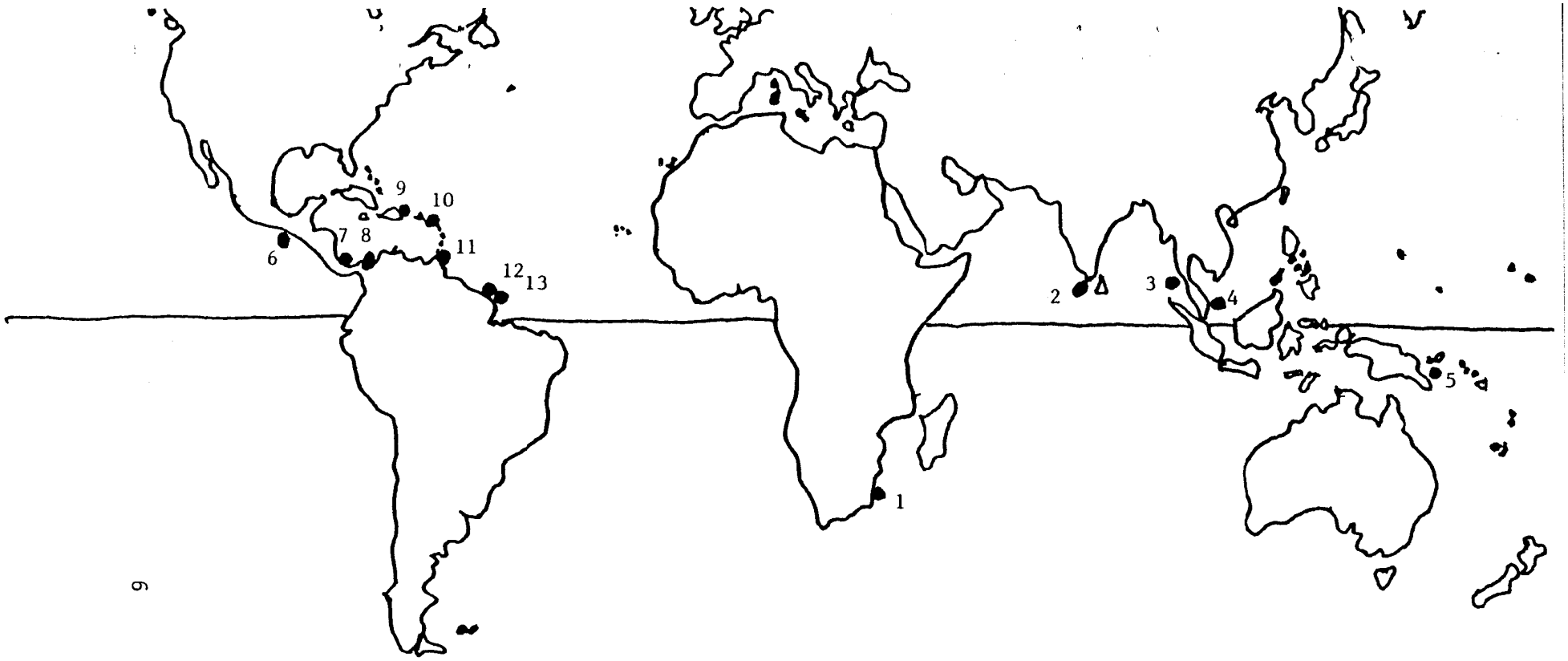

Figure 2. Important Known Nesting Areas of the Leatherback Sea Turtle

1. Tongaland Coast, Republic of South Africa
2. South coast of India and Island of Ceylon (Sri Lanka)
3. Phuket, Thailand
4. Trengganu Beach, Malaysia
5. Northern New Guinea, Solomon Islands
6. Coast of Oaxaca and Chiapas, Mexico
7. Matina, Coasta Rica
8. Gulf of Uraba, Columbia
9. Dominican Republic
10. St. Croix, U.S. Virgin Islands
11. Trinidad
12. Bigi Santi Beach, Surinam
13. Silebache, French Guiana

E. Reasons for Endangerment

All marine turtles are endangered to one degree or another. During this century, explosive development in coastal areas in many parts of the world has adversely impacted their natural environment. Nesting beaches particularly have been degraded by erosion, habitation, lights, noise, bulkheading and increased predation by both human and nonhuman predators. Deaths of adult turtles due to incidental catch by commercial fishermen and shrimpers have also risen in recent decades. Direct catches of adult and subadult specimens for food, shells, mounted specimens, and other turtle products have seriously depleted the number of certain turtle species.

The present world population of leatherback sea turtles is believed to number at least 104,000 sexually mature females. Historical population levels are not known, but it was probably never a plentiful animal.

Leatherbacks are rarely seen except on nesting beaches, and their flesh is less palatable than that of other turtle species. These facts may explain why there is no large scale organized fishery for this species. However, the deliberate taking of adults does constitute a threat to the species. Leatherbacks are killed for food in some areas. The number of nesting leatherbacks has dwindled in Peru because of this, and in Trinidad it was a serious problem until very recently. These turtles are killed and rendered for oil in Arabia and India. The oil is used to treat boat timbers. In the British Virgin Islands oil is also rendered from leatherback flesh. In that locality the oil is regarded as potent medicine for respiratory ailments. (In the late 60's a beer bottle full of oil brought a price of $15.) This tradition is not strong in the U.S. Virgin Islands. If it were, doubtless there would be few or no leatherbacks nesting on St. Croix.

Wanton slaughter of leatherback sea turtles also occurs. It apparently takes place in Guyana, where the nesting turtles are killed simply because they are believed to be "useless"! In June 1980, a leatherback was shot by fishermen in the Gulf of Mexico near Pensacola, Florida. While weighing the 272 kg (600 pound) female on fish scales at the docks, they were observed by someone who reported the incident to the proper authorities. The National Marine Fisheries Service is seeking to prosecute them.

Incidental catch of leatherback sea turtles is also a threat. They are reportedly taken in large numbers as incidental catch in commerical fishing operations in the Mediterranean Sea, and occasionally elsewhere. The greatest threat to this species is egg collecting. The Trengganu, Malaysia, nesting beach is grossly exploited for eggs. Egg harvesting is legal there, and between 80 and 90 percent of the eggs are taken each season. Up to 30 percent of these are acquired by authorities for hatching and release, but the effectiveness of this program is not known. In northern New Guinea and the Solomon Islands the leatherbacks

are harassed; presumably some adults are taken along with the eggs. In Mexico, egg collecting is illegal but commonly occurs. Researchers have noticed that the number of nesting females decreases each year, and theorize that it is because of egg collection. In Trinidad eggs are harvested, and in the Dominican Republic subsistence take of eggs is high. The large French Guiana nesting population is thought to be relatively safe because the beach is inaccessible and few people there "live off the land." Yet, some observers feel that egg poaching does occur.

Other populations which are known to have declined include those in India, Sri Lanka and Thailand. The main reason appears to be excessive removal of eggs by humans. Populations in Surinam and South Africa, which do have adequate protection, have increased in recent years.

F. The St. Croix Leatherback Population

The St. Croix leatherback sea turtle nesting population was only "discovered" by biologists a few years ago. Nesting occurs at night from late March until July. Table 1 is based on personal records of T. Skov and M. Kennedy, Virgin Islands Department of Conservation and Cultural Affairs conservation enforcement officers. These numbers represent their best estimate of numbers of nests per year as recorded from their incidental observations between 1976-1978. In 1979, there were over 80 nests counted. In 1980, the nests were not systematically counted. Figure 3 is a map of St. Croix showing the location of the nesting beaches.

Table 1. Major Leatherback Nesting Beaches on St. Croix

Location	Estimated Numbers of Nests Per Year
Sandy Point	95
Punnett Bay	25
Coakley Bay	15-20
Machioneel Bay	10
Prune Bay	9

Although this data is based on estimations and is not the result of systematic observation, the large number of nests on Sandy Point has been documented during the last several years by Otto Tranberg and others. In addition, it shows the relative importance of each nesting beach. The Punnett, Prune, and Coakley Bay beaches could be lumped together because they are near one another and together include less nesting habitat than all of Sandy Point. As mentioned earlier, the total number of female turtles which use St. Croix is probably between 50 and 70.

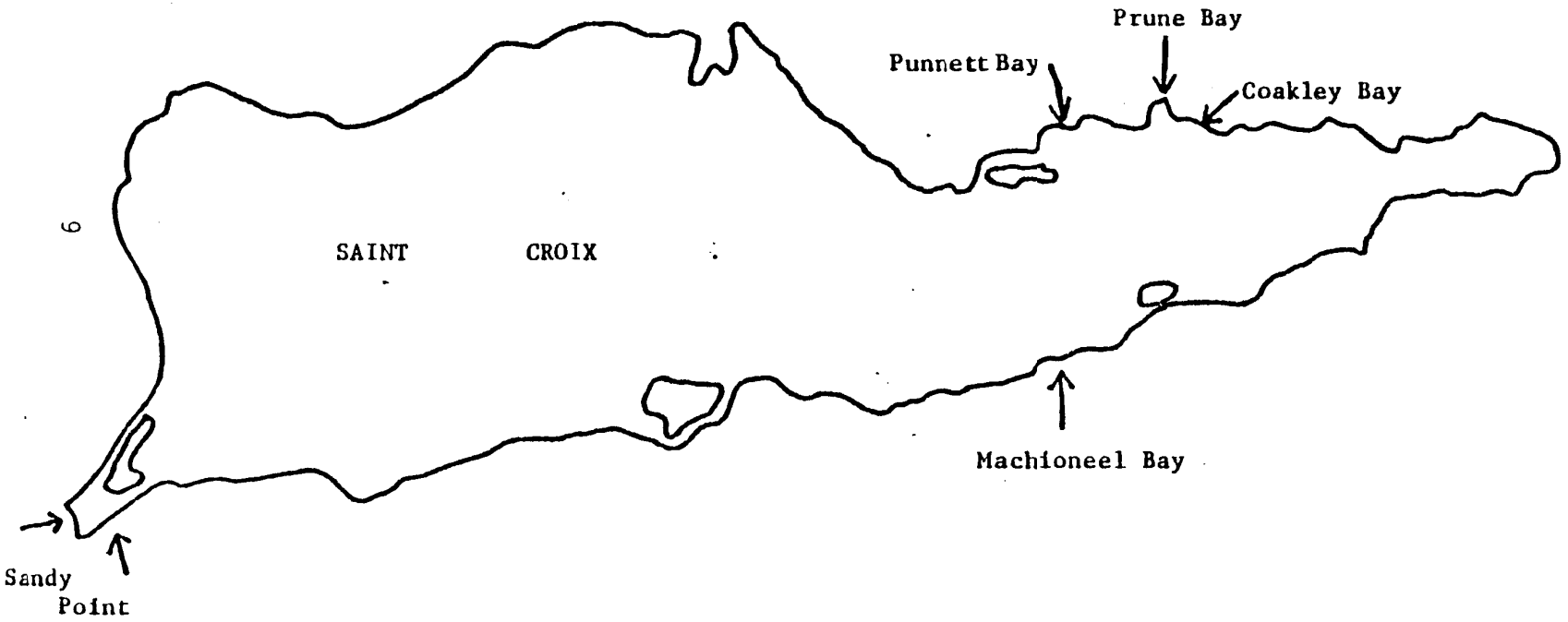

Figure 3. Location of principal leatherback sea turtle nesting beaches on St. Croix.

The greatest threat to the St. Croix leatherback population is development of Sandy Point. Most of Sandy Point is zoned W-1 "Waterfront Pleasure" which allows residential dwellings, retail shops, restaurants, marinas, and similar types of development. Under certain conditions, apartment houses, hotels, and multi-family dwellings can be built in the W-1 zone. A development plan consistent with this type of zoning was prepared in the 1960's. One of the owners stated that it was purchased for its potential as an industrial site, and he feels that although it is not zoned for industrial use at present, that eventually Sandy Point will be used for industrial purposes unless it is preserved.

At present, the Sandy Point peninsula is used only for sand mining. There are no structures or lights. It is a swimming and fishing area, but is not heavily used. A person can walk the beaches at night or during the day for hours and not see anyone, except possibly a few people on the beach near Frederiksted.

This would change if the area were developed. Any kind of development would bring in lights which would cause the hatchlings to be disoriented and not make it to the sea. There would be more people who would disturb the nests and the nesting adults either intentionally or unintentionally.

There have been incidents of vandalism of nests and harassment of adult turtles. During the 1980 nesting season, five nests were disturbed and three adults killed. This fairly high degree of disturbance may be due to the fact that surveillance in 1980 was not as consistent as in past years.

Although adult leatherbacks are not distracted by lights, hatchlings can be disoriented by shoreline lights. At Sandy Point hatchlings are sometimes confused by the lights of Frederiksted and head in the direction of the lights and not toward the ocean.

Sand mining, as it is carried out now, is not a real threat to the turtle nests since it is being done well behind the dune line. The sand mining permit requires that the excavated areas be filled and revegetated. Undoubtedly illegal sand excavation occurs since sand is expensive and not plentiful in the Virgin Islands. Persons illegally taking sand are far more likely to get it from the beach itself and could disturb turtle nests.

The Sandy Point peninsula is very stable and may be growing at a slow rate. However, the beaches are very changeable; a wide beach can become very narrow in the space of a few days or weeks, and turtle nests close to the sea can be washed away by this beach erosion. This apparently is not a long-term threat, as doubtless it has been occurring for centuries, but it does account for the loss of some leatherback nests. Likewise, natural predation due to night herons and ghost and jumbi crabs, all of which live at Sandy Point, probably occurs but is perhaps not significant.

To sum up, the threats to the leatherback sea turtle on Sandy Point (and elsewhere on St. Croix) are not serious ones, provided that Sandy Point remains as it is. Development of any kind in this area would probably speed the doom of the only U.S. leatherback population.

G. Protective Laws and Actions

The leatherback sea turtle was listed as an Endangered species by the U.S. Department of the Interior in 1970. It is also listed on Appendix 1 of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). This species is protected by law in most of the countries where nesting occurs; however, enforcement of these laws varies with the country.

Critical Habitat for the leatherback has been designated by both the Fish and Wildlife Service (which has jurisdiction over sea turtles while they are on land) and the National Marine Fisheries Service (which has jurisdiction when they are in the sea). In September 1978, the Fish and Wildlife Service designated a strip of land on Sandy Point, St. Croix, U.S. Virgin Islands, as Critical Habitat, and in March 1979 the National Marine Fisheries Service determined the surrounding waters to be Critical Habitat for this species. (See Figures 4 and 5.)

In 1972 a law was passed in the Territory for the protection of sea turtles in the U.S. Virgin Islands. This law makes it unlawful to kill, possess, harm, etc., marine turtles in the sea from May to September.

Since the Sandy Point rookery was "discovered" in the mid-1970's, there have been efforts to patrol the area, count nests, tag turtles, rescue disoriented hatchlings and apprehend persons disturbing the animals and their nests. Several agencies have been involved: the Virgin Islands Bureaus of Fish and Wildlife and Environmental Enforcement, National Marine Fisheries Service, and the U.S. Fish and Wildlife Service.

Unfortunately there has not been consistent involvement from year to year. In most cases funds have not been available to do a thorough job, and sometimes the efforts have not been as coordinated or well organized as they could have been. These efforts have nevertheless been a step in the right direction, and were much enhanced beginning in FY 1981 as the result of grant-in-aid funding made available to the Virgin Islands Department of Conservation and Cultural Affairs pursuant to a Cooperative Agreement under the Endangered Species Act. Included among current (1981) grant project objectives are law enforcement for Sandy Point during the leatherback nesting season, transplanting of nests threatened by beach erosion, a general quantification of the nesting effort, and a tagging program. Completion of these objectives and others identified in this Recovery Plan will assure the future of the St. Croix leatherbacks.

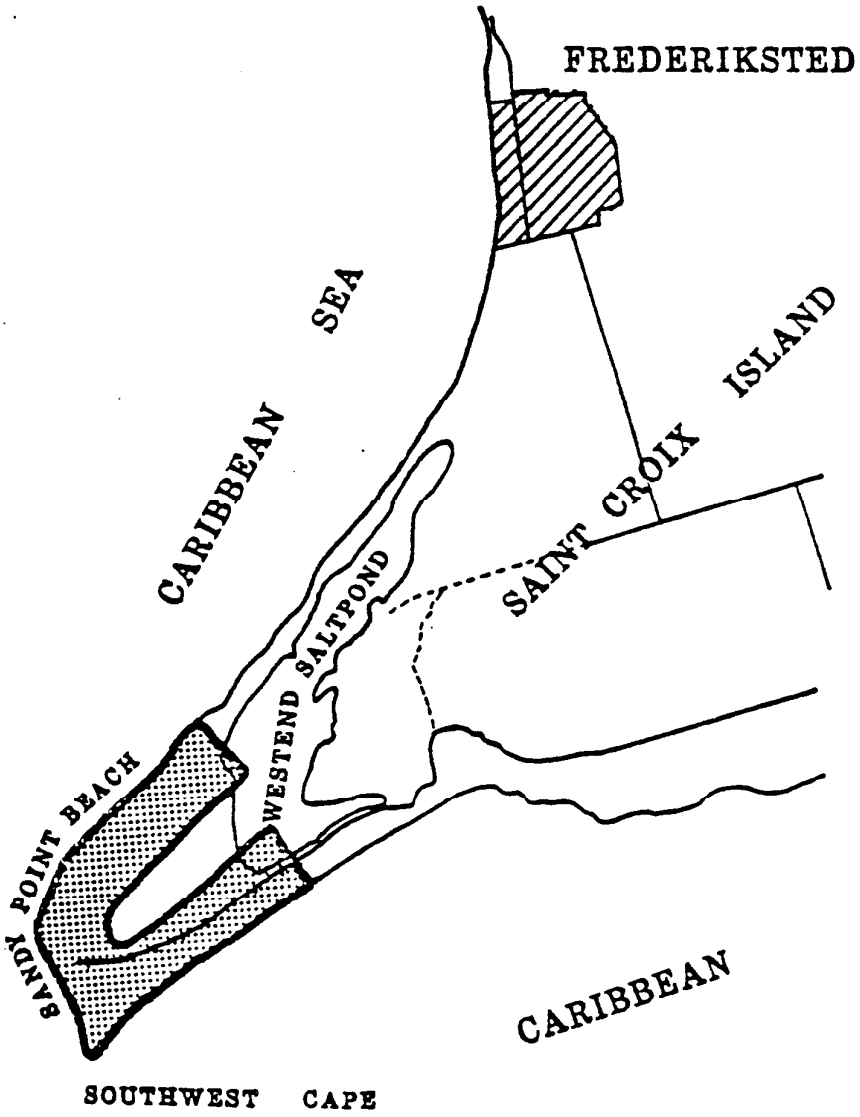

Figure 4. Critical Habitat for the leatherback sea turtle, Sandy Point, St. Croix

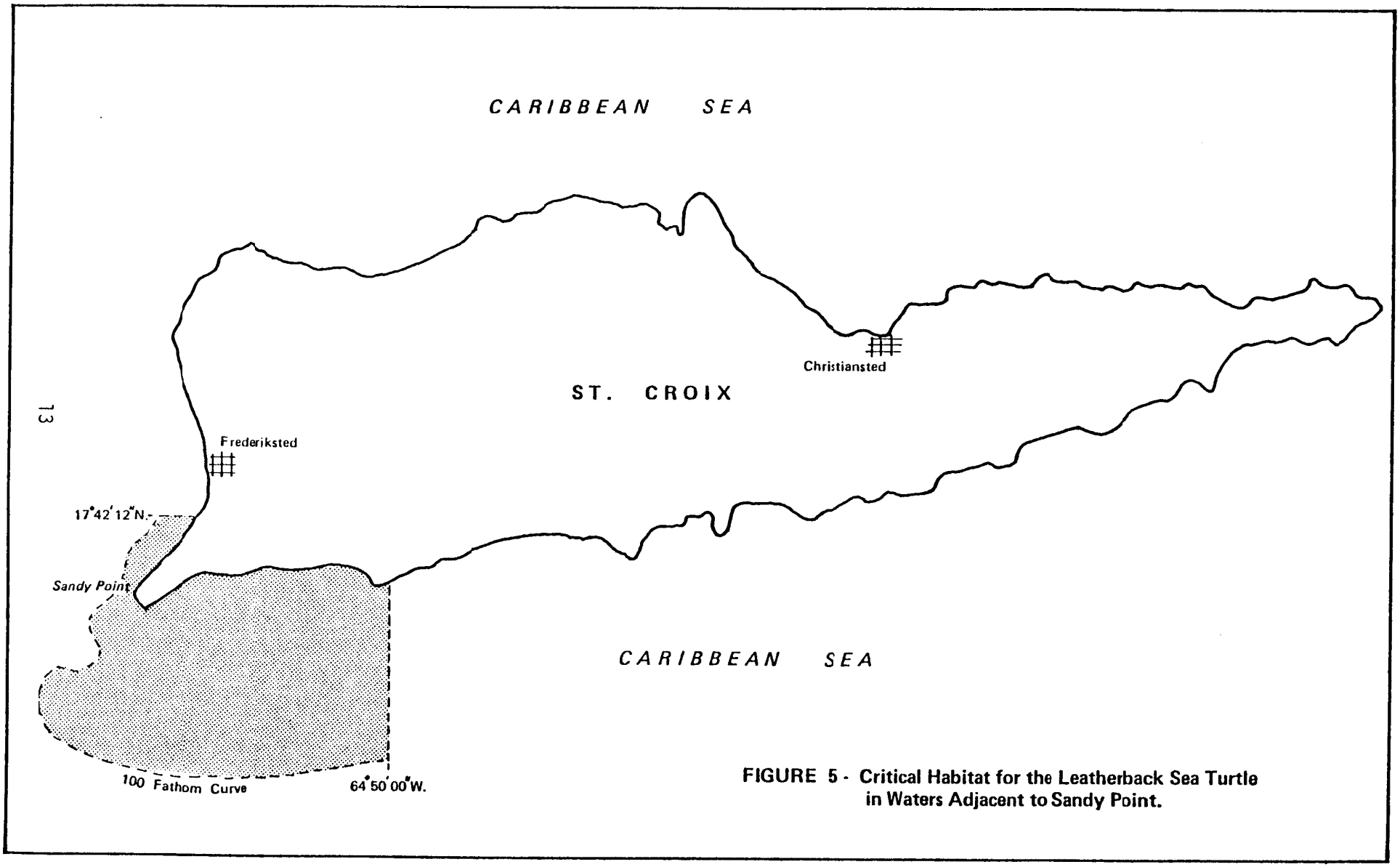

FIGURE 5 - Critical Habitat for the Leatherback Sea Turtle in Waters Adjacent to Sandy Point.

Part II - Recovery

Recovery Plan Outline

PRIME OBJECTIVE: To maintain and attempt to increase the St. Croix (USVI) population of leatherback sea turtles by protecting the turtles and their nesting habitat.

1. Preserve and protect the nesting beach habitat on St. Croix.

    11. Give first priority to acquiring or otherwise preserving the Sandy Point nesting habitat.

    12. Preserve other second priority areas through acquisition, lease, easement, or other feasible means.

2. Quantitatively assess the existing population.

    21. Consolidate available nesting data.

    22. Conduct tagging program.

        221. Determine intra-season renesting frequency for individuals.

        222. Determine inter-season nesting frequency for individuals.

    23. Evaluate nesting success.

3. Provide protection to the adults, hatchlings, and eggs.

    31. Patrol beaches to prevent human impacts.

    32. Assess predation and provide control as necessary.

    33. Move nests threatened by beach erosion.

    34. Evaluate hatchling disorientation problem.

4. Conduct public education program.

Recovery Narrative*

To perpetuate and hopefully enhance the St. Croix population of leatherback sea turtles will require protection of the turtles at all stages in their life cycle, and also protection of their nesting habitat. The most urgent need is to protect the nesting beach habitat insuring that its suitability for leatherback nesting is maintained. Sandy Point, which has already been designated as Critical Habitat, is by far the most important nesting area on St. Croix (see Table 1, p. 7) and the area most in need of permanent preservation through government ownership (11). If Sandy Point or any of the lesser nesting sites cannot be preserved through fee acquisition, then the most feasible alternative, whether by lease, easement, or other means, should be used (12).

The St. Croix nesting population needs to be quantitatively assessed to provide baseline population data (2). Nesting and tagging data already gathered by various individuals should be consolidated as a starting point (21). Unfortunately, most of this information has been gathered incidental to other activities for only a relatively short period of time and it is not completely accurate. In order to refine population estimates, a systematic tagging program is needed to better determine nesting periodicity for individuals, both intra-season and inter-season (221 and 222). The tagging program should run for 10 to 15 years. Additionally, the percentage of eggs which hatch should be studied for 3 years to provide a basis for judging possible harmful effects arising from relocating nests for management purposes (23).

Nesting females, eggs and hatchlings are adversely impacted each year by a variety of detrimental factors including beach erosion and vandalism by humans (3). The beaches should be patrolled by law enforcement officers, and patrols should be of sufficient frequency and duration to deter vandals and poachers. Violators should be prosecuted (31). The degree to which turtle nests are being disturbed by predators, such as mongooses and wild dogs, should be evaluated and control measures applied as necessary (32). These measures might include trapping and constructing wire nest guards. Nests that are obviously going to be lost because of beach erosion need to be moved to a safe location (33). In the past, a certain number of hatchlings have been disoriented by the lights of Frederiksted and have been unable to reach the ocean. This problem needs to be evaluated and, if justified, corrective measures should be applied (34).

Some of the problems caused by humans could possibly be alleviated by means of educational material presented through the local communications media, and by the use of informational/warning type signs and posters (4).

* Keyed to preceding outline.

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C. Letters

Ogren, Larry H. U.S. Department of Commerce, National Marine Fisheries Service, Panama City, Florida. (November 6, 1979, letter to Donald J. Hankla)

Ogren, Larry H. U.S. Department of Commerce, National Marine Fisheries Service, Panama City, Florida. (June 28, 1977, letter to James C. Tyler)

PART III.

IMPLEMENTATION SCHEDULE

Priorities within this section (Column 4) have been assigned according to the following:

Priority 1 - Those actions absolutely necessary to prevent extinction of the species.

Priority 2 - Those actions necessary to maintain the species' current population status.

Priority 3 - All other actions necessary to provide for full recovery of the species.

Leatherback Turtle - St. Croix Population

Part III Implementation Schedule

General Category	Plan Task	Task Number	Priority	Task Duration	Responsible Agency			Estimated Fiscal Year Costs			Comments/Notes
					FWS Region	FWS Program	Other	FY 1982	FY 1983	FY 1984	
A 6	Acquisition of Sandy Point nesting beach	11	1	1 yr.	4				5,000,000		
A1, A2 A3	Preservation of other nesting areas	12	2	Cont.**	4						
I 7	Consolidate available nesting data	21	3	1 yr.	4		VI-DCCA*				
R 7	Conduct tagging program	22	3	10-15 yrs.	4		VI-DCCA	32,300	32,300	32,300	This funding includes tasks Nos. 21, 23, 32, and 33; presently ongoing (FY81) under Cooperative Agreement
R 7	Evaluate nesting success	23	3	3 yrs.	4		VI-DCCA	-	-	-	
O 2	Conduct beach patrols	31	2	Cont.	4		VI-DCCA	20,000	20,000	20,000	Ongoing (FY 81) under Cooperative Agreement.
R 9	Assess natural predation	32	3	2 yrs.	4		VI-DCCA	-	-	-	
M 7	Relocate nests threatened by beach erosion	33	2	Cont.	4		VI-DCCA	-	-	-	
R 7	Evaluate hatchling disorientation problem	34	3	1 yr.	4		VI-DCCA			5,000	
O 1	Conduct public education program	4	3	Cont.	4		VI-DCCA	4,000	4,000	4,000	Ongoing (FY 81) under Cooperative Agreement

* Virgin Island Department of Conservation and Cultural Affairs
** Continuing

GENERAL CATEGORIES FOR IMPLEMENTATION SCHEDULES *

Information Gathering - I or R (research)

1. Population status
2. Habitat status
3. Habitat requirements
4. Management techniques
5. Taxonomic studies
6. Demographic studies
7. Propagation
8. Migration
9. Predation
10. Competition
11. Disease
12. Environmental contaminant
13. Reintroduction
14. Other information

Management - M

1. Propagation
2. Reintroduction
3. Habitat maintenance and manipulation
4. Predator and competitor control
5. Depredation control
6. Disease control
7. Other management

Acquisition - A

1. Lease
2. Easement
3. Management agreement
4. Exchange
5. Withdrawal
6. Fee title
7. Other

Other - O

1. Information and education
2. Law enforcement
3. Regulations
4. Administration

* (Column 1) - Primarily for use by the U.S. Fish and Wildlife Service.